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Recent Studies of Ethnic Differences in the Cognitive Ability of Adolescents in the United Kingdom

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Research from the 20th century showed that ethnic minorities under-performed White British on measures of cognitive ability in the United Kingdom. However, academic qualification results from the first two decades of the 21st century suggest minimal to reverse ethnic differences. To better understand the pattern of contemporary cognitive differences among adolescents in the 21st century, we analyzed academic achievements at age 16 in the GCSE and cognitive ability in four cognitive tests: the National Reference Test, NRT; the Programme for International Student Assessment, PISA; Cognitive Ability Test 3 (CAT3); and Center for Evaluation and Monitoring (CEM) 11-plus. Results from the PISA, CAT3 and CEM 11-plus tests correlate strongly across ethnic groups. These results show that Bangladeshi, Pakistani and Black students score approximately one half of a standard deviation below Indian and White students, while Chinese students perform significantly above the latter groups. In contrast, but consistent with academic qualifications, results based on the NRT suggest smaller ethnic gaps.
Key Words: Ethnicity; cognitive ability; intelligence; educational attainment; UK

In the first half of the 20th century, the UK population was nearly all white. This changed following the British Nationality Act of 1948 that gave all citizens of the British Commonwealth the right of British citizenship and residence in the United Kingdom. This right was taken up by a number of non-Europeans as a result of which by 1981 these were 6% of the population (Owen, 1995). In the

most recent census (2011), non-Europeans were estimated as 13% of the population. 38% of the non-Europeans were South Asian, 16% were other Asian, 25% were Black, and 22% were mixed or other (e.g., Middle Eastern). These non-European minority groups are concentrated in Greater London, the West Midlands, Greater Manchester, West Yorkshire and the Leicester/Nottingham region.

From the mid-1960s, a number of studies of these non-European immigrants reported that their average educational attainment and intelligence were lower than those of the indigenous population (Taylor & Hegerty, 1985; Tomlinson, 1980, 1983). Between 1966 and 1983, seventeen studies of the intelligence of Blacks gave a median IQ of 87 and five studies of ethnic Indians and Pakistanis gave a median IQ of 91 (Lynn, 2015, pp. 87, 137). In 1976, the British government established a commission to inquire into the reasons for these lower average educational attainments and intelligence. This published its conclusions in the Swann Report (1985), in which an appendix reported further data confirming the previous studies. The most recent review reports two studies of the IQ of Blacks published in the twenty-first century giving IQs of 89 and 91, suggesting an improvement on earlier studies, but does not give any twenty-first century data for South Asians or Chinese (Lynn, 2015, pp. 87, 137). In the present paper, we report more recent data of the educational attainment and intelligence of ethnic populations in Britain.

Results

The data were made available through Open Science Frame at: https://osf.io/24vbu/

1. General Certificate of Secondary Education (GCSE)

In this study we examine race differences in educational attainment in the General Certificate of Secondary Education (GCSE) taken by 16-year-olds in England and Wales but not in Scotland. Scores for major ethnic groups are computed from the early 1990s, when the Department for Education (DfE) first began reporting scores by Asian subgroups. Finer subdivisions, which we have incorporated when possible, were added in the early 2000s. For comparison and interpretability, we first transformed qualification pass rates into deviation scores, using an inverse cumulative function transformation (La Griffe du Lion, 2000; Reardon & Ho, 2015) and then converted deviation scores into the IQ metric.

The GCSE normally consists of around nine subjects and the results are graded from A* to D with F as fail. Five or more GCSEs at grades A*-C is regarded as a good result. Since the difficulty of GCSE has changed substantially from

1991 to 2017 (Gillborn et al., 2017), we selected metrics which seem to be most equivalent in content across years and which also had similar pass and difficulty rates. Scores are relative to a White mean of 100. The results are given in Table 1a,b.

Table 1a,b. *Five or more GCSEs at grades A*-C by ethnic group from 1991 to 2018, with original pass percentages reported above and results scaled to the IQ metric below.*

	White	Chinese	Other Asian	Indian	Pakistani
			Results expressed as % passing		
1991	37		46	38	26
1993	43		50	45	24
1995	45		61	48	23
1997	47		61	54	29
1999	50		72	60	29
2001	52		64	60	40
2003	55		65	72	38
2005	44.4	65.8	51.6	59.1	34.6
2007	48.4	69.9	52.4	65.1	40.0
2009	55.1	75.5	58.1	71.6	49.5
2011	59.0	76.7	62.1	74.7	54.9
2013	58.6	75.2	63.8	74.2	53.4
2015	62.8	82.8	72.6	77.3	58.1
2017	63.9	87.3	75.1	79.2	61.3
2018	64.3	89.3	76.1	80.0	62.2
			Results transformed to IQ metric		
1991	100			100.4	95.3
1993	100			100.8	92.1
1995	100			101.1	90.8
1997	100			102.6	92.8
1999	100			103.8	91.7
2001	100			103.1	95.5
2003	100			106.9	93.5
2005	100	108.2	102.7	105.6	96.2
2007	100	108.4	101.5	106.4	96.8
2009	100	108.4	101.1	106.6	97.9
2011	100	107.5	101.2	106.6	98.4
2013	100	107.0	102.0	106.5	98.0
2015	100	109.3	104.1	106.3	98.2
2017	100	111.8	104.8	106.9	99.0
2018	100	113.1	105.2	107.1	99.2

	Bangladeshi	Black	Caribbean	African
		Results expressed as % passing		
1991	14	23	23	
1993	20	21	21	
1995	25	23	23	
1997	33	29	29	
1999	29	38	38	
2001	43	36	36	
2003	44	34	34	
2005	39.0	33.6	33.6	37.5
2007	45.0	40.7	40.7	43.9
2009	54.2	49.3	49.3	53.3
2011	62.7	55.2	55.2	58.5
2013	63.4	55.4	55.4	58.9
2015	67.3	59.2	59.2	63.4
2017	69.2	59.8	59.8	65.0
2018	70.3	59.3	59.3	64.4
		Results transformed to IQ metric		
1991	88.8	93.9		
1993	90.0	90.6		
1995	91.8	90.8		
1997	94.5	92.8		
1999	91.7	95.4		
2001	96.6	93.9		
2003	95.9	91.9		
2005	97.9	95.8	94.0	97.3
2007	98.7	97.1	95.4	98.3
2009	99.7	97.8	95.8	99.3
2011	101.5	98.6	96.7	99.8
2013	101.9	98.8	96.6	100.1
2015	101.8	98.6	95.4	100.2
2017	102.2	98.4	94.1	100.4
2018	102.5	98.0	93.9	100.0

Note: The transformation of pass rates into IQ-metric scores assumes a normal curve approximation and equal variances, which could not be verified. Scores from 1991 to 2005 were based on the percent achieving 5 or more GCSEs at grades A*-C and came from The Youth Cohort Study (YCS) reported by Strand (2015). For 2007 to 2009, we used percent achieving '5+ A*-C grades inc. English & mathematics GCSEs,' which was the

closest equivalent to 5 or more GCSEs at grades A*-C scores for 1991 to 2005. For 2011 to 2018, we used percentage of pupils achieving 'grade 4/C or above in English and maths GCSEs,' since these have similar pass rates as the previously used GCSE metrics. The 2007 to 2018 scores were obtained from the DfE's report "GCSE and equivalent attainment by pupil characteristics".

The salient features of these results are as follows: (1) Chinese performed over half a standard deviation better than Whites from 2005 to 2013; by 2018, the advantage came close to one standard deviation (113.14); (2) Other Asians consisting of Japanese, Southeast Asians, Iranians, etc. performed better than Whites from 1991 to 2018; (3) Indians performed approximately the same as Whites in 1991 and improved by about one half of a standard deviation by 2003; (4) Pakistanis performed worse than Whites in 1991 but improved, almost reaching parity (99.16) with Whites in 2018; (5) Bangladeshis performed worse than Whites in 1991 but improved considerably to perform marginally better than Whites from 2011 to 2018; (6) Black Caribbeans, who constituted most Black students in the 1990s, improved from around 92 in the early 1990s to around 94 in 2018; (7) African Blacks improved from 97.33 in 2005 to parity with Whites (100.04) in 2018.

These results show improvements in the academic qualifications of ethnic minorities over the years 1991 to 2018. However, the reasons for the improvements are not clear. GCSE qualifications are based on both tests and class work so that these changes could be due to improvements in intelligence or to motivational or personality factors which can influence scores. To elucidate this problem, we next examine recent intelligence and academic achievement test scores by ethnic group.

2. The National Reference Test

In this study we examine National Reference Test (NRT) data for 2019. The NRT is a test of English language and mathematics which is given to a nationally representative sample of year 11 students with an average age of 16 years in England. The data were obtained from the Office of Qualifications and Examinations Regulation (Ofqual) following a Freedom of Information Act (FOIA) request. Ofqual provided item response theory (IRT) scores for the major ethnic groups. We converted all scores into an IQ metric with standard deviations of 15 and set the total White ethnic group to a score of 100.00 as the reference group. Standard deviations were not available and the standard errors provided were based on nested data at the school level. As a result, it was not possible to obtain unbiased group-level standard deviations. Ofqual provided both IRT scores and pass rates. We treated the IRT scores as standardized scores. To verify accuracy,

we additionally converted the pass rates into deviation scores using an inverse cumulative function transformation (La Griffe du Lion, 2000; Reardon & Ho, 2015). Since ethnic scores were very similar regardless of method, with an average absolute difference of only 0.015, we only report the IRT-based scores. Moreover, we computed the composite scores using the formula given by Sackett & Ellingson (1997):

$$d = \frac{\sum_{i=1}^{k} \quad d_i}{\sqrt{(k + k(k-1)r_{ii})}}$$

where d_i is the *d*-value for each predictor, *k* is the number of predictors, and r_{ii} is the average correlation between predictors. Composite scores take into account the subtest correlations and are more comparable to IQs, which are also composites. Following Sackett & Shen's (2010) method, we used an average correlation of $r = .65$, as this is the typical correlation found between reading and math tests based on large samples. The results are given in Table 2.

Table 2. *National Reference Tests Reading and Math scores in England in 2019.*

	Reading		Math		Average	Composite
	N	***M***	***N***	***M***	***M***	***M***
White	4428	100.00	4384	100.00	100.00	100.00
Mixed	213	100.21	232	99.76	99.99	99.98
All Asian	625	100.63	670	100.27	100.45	100.50
Black	280	97.45	223	96.55	97.00	96.70
Other	64	99.55	98	99.66	99.60	99.56
Unclassified	1129	99.03	1218	96.60	97.81	97.59

The salient features of these results are as follows: (1) The Mixed and All Asians performed approximately the same as Whites. The All Asians group includes Chinese, South Asians and other Asians. In the 2018 GCSE results given in Table 1, the All Asian score comes to 103.15 (adjusting for the portion of each Asian group which took the test) so Asian adolescents have higher GCSE qualifications than expected based from the NRT test scores (100.50); (2) Blacks, with a score of 96.70, slightly under-perform Whites and this score is slightly worse than their 2018 GCSE score of 98.0 shown in Table 1 but the results are consistent in that on both measures Blacks perform slightly worse than Whites. These results, like those for the GCSE given in Table 1, and like subsequent studies below, are for school students in maintained (i.e., state) schools and do not include the approximately 7 percent of students in private fee-paying schools

who are mainly Whites and have higher IQs. Hence the data may underestimate the IQs of Whites.

3. Programme for International Student Assessment

In this study we examine results in the Programme for International Student Assessment (PISA), a study of 15-year-old school pupils' performance in mathematics, science and reading conducted every three years in a number of countries by the Organisation for Economic Co-operation and Development (OECD). The data are given for 2006-2018 and were obtained for England from the DfE following a Freedom of Information Act (FOIA) request. As with the NRT data presented above, we converted all scores into the IQ metric with standard deviation of 15. For reference, we set the total White ethnic group to a score of 100.00. Ethnic-specific standard deviations were not available so we used the standard deviations for the whole of the United Kingdom as reported by the OECD. Specifically, we used year and subject specific standard deviations to convert each of the 18 subject-by-year scores. In computing the composite scores, we used an average correlation of r = .833 based on the subtest correlations reported in the 2015 technical report (OECD, 2016, Table 12.15). The results are given in Table 3.

Table 3. *Mean PISA Reading, Math, and Science scores in England from 2006-2018.*

	N	Reading	Math	Science	Average	Composite
White	*16864*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
British	16087	100.13	100.10	99.93	100.05	100.05
Irish	78	103.63	101.94	102.03	102.53	102.69
Any other White	699	96.66	97.51	96.68	96.95	96.76
Mixed	*751*	*100.5*	*99.68*	*99.54*	*99.91*	*99.90*
White / Black Caribbean	212	97.89	96.44	96.99	97.11	96.93
White / Black African	103	97.94	96.82	96.20	96.99	96.81
White / Asian	177	104.09	103.91	102.82	103.61	103.83
Any other mixed	259	101.22	100.56	100.7	100.83	100.88
All Asian	*2068*	*96.39*	*96.49*	*95.23*	*96.03*	*95.79*
South Asian	*1699*	*95.55*	*95.32*	*94.27*	*95.05*	*94.75*
Indian	577	99.34	99.56	98.67	99.19	99.14
Pakistani	819	92.92	92.70	91.43	92.35	91.88
Bangladeshi	303	95.43	94.38	93.56	94.45	94.11
Chinese & Other Asian	*369*	*100.28*	*101.84*	*99.61*	*100.58*	*100.61*
Chinese	82	106.67	107.5	106.53	106.9	107.32
Any other Asian	287	98.46	100.22	97.64	98.77	98.69
Black	*1045*	*94.02*	*92.80*	*92.13*	*92.98*	*92.56*

	N	Reading	Math	Science	Average	Composite
Black Caribbean	286	93.51	91.86	91.58	92.32	91.85
Black African	609	94.27	93.1	92.19	93.19	92.77
Any other Black	150	93.93	93.38	92.96	93.42	93.03
Gypsy & Irish Traveler	*17*	*77.4*	*80.09*	*79.68*	*79.05*	*77.78*
Any other	*289*	*96.31*	*96.21*	*95.16*	*95.9*	*95.65*

The salient features of these results are as follows: (1) The Chinese obtained the highest score at 107.32; (2) Indians scored at 99.14, almost as highly as Whites; (3) Pakistanis and Bangladeshis performed well below Whites at 91.88 and 94.11, respectively: (4) Black Caribbeans and Black Africans performed well below Whites at 91.85 and 92.77, respectively; (5) Mixed race individuals of European and African heritage scored intermediate between the parent races; (6) Gypsy / Irish Travelers obtained the lowest score of 77.78.

4. The Cognitive Ability Test

In this study we examine results in the Cognitive Ability Test (CAT). Data were for CAT3 for UK students aged 11 to 12 years in 2009-2010 from Granada Learning Assessment (GL Assessment, 2010), previously NFER-Nelson, and provide verbal, quantitative and non-verbal scores. GL Assessment verified the accuracy of these results (C. Fernandes, personal communication, August, 4, 2014) and informed us that they did not have more recent data. We used the standard deviation pooled across ethnic groups. For CAT3 composite scores, we used an average correlation (r_{ii}) of $r = .71$; this was based on the CAT3 domain correlations reported by Deary et al. (2007, Table 2). The results are given in Table 4.

Table 4. *Mean scores on CAT3 for 11-12 year olds in 2009-2010.*

Ethnic Group	N	Verbal	Quant.	Non-verbal	Average	Composite
White	*148566*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
White British	145340	100.04	100.11	100.34	100.16	100.18
Irish	492	100.25	99.89	98.75	99.63	99.59
Other White	2734	97.93	100.00	100.88	99.60	99.56
Mixed	*4338*	*99.65*	*99.78*	*99.73*	*99.72*	*99.69*
White / Black Caribbean	1589	97.40	97.45	96.95	97.27	96.96
White / Black African	367	99.73	99.47	99.60	99.60	99.55
White / Asian	853	102.36	103.08	102.89	102.78	103.09
Other mixed	1529	100.46	100.42	100.88	100.59	100.65
South Asian	*8445*	*91.72*	*97.83*	*96.00*	*95.18*	*94.64*

Ethnic Group	*N*	Verbal	Quant.	Non-verbal	Average	Composite
Indian	3296	96.14	101.80	99.18	99.04	98.93
Pakistani	3703	88.86	95.01	93.13	92.33	91.48
Bangladeshi	1446	88.96	95.97	96.10	93.68	92.97
Chinese & Other Asian	*1384*	*96.30*	*104.57*	*105.11*	*101.99*	*102.22*
Chinese	519	99.73	110.08	111.81	107.20	108.01
Other Asian	865	94.24	101.27	101.09	98.87	98.74
Black	*4650*	*91.48*	*93.70*	*93.08*	*92.75*	*91.94*
Black Caribbean	1978	92.13	93.42	93.23	92.93	92.14
Black African	2197	90.44	93.64	92.70	92.26	91.39
Other Black	475	93.61	95.12	94.19	94.30	93.67
Other ethnic group	*979*	*92.02*	*99.79*	*99.81*	*97.21*	*96.90*
Gypsy & Irish Traveler	*160*	*84.23*	*86.65*	*87.89*	*86.26*	*84.72*
Traveler Irish	110	84.95	86.32	87.92	86.40	84.88
Gypsy/ Roma	50	82.63	87.38	87.82	85.94	84.37
Unclassified	*5076*	*99.09*	*99.05*	*99.50*	*99.21*	*99.12*

The salient features of these results are as follows: (1) The Chinese obtained the highest score at 108.01, consistent with previous studies; (2) Indians scored at 98.93, almost as highly as Whites; (3) Pakistanis and Bangladeshis performed well below Whites at 91.48 and 92.97, respectively: (4) Black Caribbeans and Black Africans performed well below Whites at 92.14 and 91.39, respectively: (5) Mixed race individuals of European and Afro-Caribbean heritage performed intermediate between the parent races; (6) Irish Travelers and Gypsies obtained the lowest scores of 84.88 and 84.37, respectively. Of note also is that the CAT3 scores are very similar to the PISA ones. In fact, for the 17 specific ethnic groups for which there were both PISA and CAT3 scores, the correlation between the composites was $r = .93$ and the average absolute difference was only 1.30 points.

5. CEM 11-plus in Buckinghamshire

In this study we examine results in the CEM 11-plus in Buckinghamshire, a county in southern England with a population of approximately 500,000. The sample consists of all 10-year-old children who took an intelligence test in the eleven-plus examination for entry to selective Grammar Schools. The test was constructed by the Centre for Evaluation and Monitoring (CEM) at the University of Durham and is designated CEM 11-plus. The test measures verbal, quantitative, and non-verbal abilities. Since we had individual data for CEM 11-plus, we computed composites by applying principal factor analysis to the three

domain scores and outputting general factor scores. The data are given by Stothard et al. (2018) for the years 2014, 2015 and 2016 and the results are shown in Table 5.

Table 5. *CEM 11-plus results for Buckinghamshire in 2014, 2015 and 2016, mean values by group.*

	N	Verbal	Quant.	Non-verbal	Average	*g*
White	*9979*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
British	9495	100.14	100.00	99.97	100.04	100.04
Other	484	97.17	99.98	100.58	99.24	99.30
Mixed	*812*	*98.88*	*99.35*	*99.41*	*99.21*	*99.17*
White / Black Caribbean	294	92.63	92.41	92.74	92.60	91.89
White / Black African	60	98.25	98.77	99.47	98.83	98.66
White / Asian	265	105.42	106.07	104.70	105.40	106.11
Other mixed	193	99.61	100.89	102.28	100.93	100.90
South Asian	*1839*	*95.60*	*99.22*	*96.30*	*97.04*	*97.48*
Indian	399	110.15	115.77	110.94	112.29	114.47
Pakistani	1440	91.57	94.63	92.24	92.81	92.77
Chinese & Other Asian	*304*	*102.41*	*107.44*	*106.29*	*105.38*	*106.39*
Chinese	45	110.52	114.50	115.06	113.36	114.73
Other Asian	259	101.00	106.21	104.77	103.99	104.94
Black	*282*	*92.64*	*92.13*	*91.01*	*91.93*	*91.36*
Black Caribbean	124	89.97	89.22	88.98	89.39	88.46
Black African	135	95.32	95.37	93.36	94.68	94.52
Other Black	23	91.29	88.81	88.18	89.43	88.42
Other	*61*	*99.12*	*102.19*	*101.92*	*101.08*	*101.44*
Missing	*120*	*104.23*	*105.13*	*103.24*	*104.20*	*104.91*

The salient features of these results are as follows: (1) the Chinese obtained the highest score at 114.73; (2) Indians obtained a much higher score than Whites at 114.47; (3) Pakistanis performed well below Whites at 92.77; (4) Black Caribbeans and Black Africans performed well below Whites at 88.46 and 94.52, respectively: (5) Mixed race individuals of European and African heritage scored intermediate between the parent races. These results mirror the PISA and CAT3 ones, except that Indians perform substantially higher than expected based on CAT3 and PISA scores (114 vs. 99). The correlation between CEM 11-plus and

both PISA and CAT3 was > .7 for the 14 specific ethnic groups for which there were corresponding PISA and CAT3 data. The results for the main groups are summarized in Table 6.

Table 6. *Summary of results from GCSE academic qualifications and cognitive tests.*

	GCSE 2018	NRT	PISA	CAT3	CEM 11-plus
White	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*
All Asian	*103.15*	100.50	95.79	95.71	98.74
Chinese	113.14		107.32	108.01	114.73
Indian	107.13		99.14	98.93	114.47
Pakistani/Bangladeshi	100.15		*92.48*	*91.90*	*92.77*
Black	*98.03*	*96.70*	*92.56*	*91.94*	*91.36*
Black Caribbean	93.86		91.85	92.14	88.46
Black African	100.04		92.77		94.52

Discussion

There are four principal points of interest in the results. First, the data in Table 1 show that all ethnic minorities registered secular improvements relative to Whites in educational qualifications assessed in GCSEs from 1991 to 2018. These are likely attributable to improvements in the environment in Britain in the standard of living, nutrition, education and health care. In addition, a likely reason for the improvements of the three groups from the Indian sub-Continent may have been that in the early 1990s many of them were recent immigrants who did not speak English as their first language or at all when they arrived. As they learned English their educational performance improved. Additionally, more recent waves of migrants may be more educated. For example, according to The Institute for Employment Research's Brain Drain dataset (Brücker, Capuano & Marfouk, 2013), 22% of Indian migrants to the UK between 1980 and 1990 had high levels of educational attainment, while 40% did between 2000 and 2010.

Second, the results given in Table 6 show that ethnic differences in the NRT are generally similar to those in GCSEs. Since the NRT is designed to measure changes in GCSE math and reading qualification difficulty, this is as expected. These NRT results suggest typically small ethnic differences.

Third, Table 6 shows that Whites generally perform relatively better in PISA, CAT3, and CEM 11-plus. Thus Black Africans score well below Whites on the three intelligence measures but performed better in educational attainment assessed in GCSEs. Likewise, Indians score slightly lower than Whites on two of

the intelligence measures (PISA and CAT3) but performed about one half of a standard deviation better than Whites in educational attainment. Moreover, Pakistanis and Bangladeshis score at about parity with Whites in the recent GCSEs but perform well below Whites on the three intelligence measures. Finally, Chinese perform much better than Whites on recent GCSEs (*M* = 113.14) but have a smaller advantage on PISA and CAT3. These results suggest that Whites perform less well on GCSE due to lower motivation and personality related factors, which affect intelligence tests less. The discrepancy between GCSE/NRT and other results needs to be explored in future research.

Fourth, on PISA Gypsy / Irish Travelers obtained the lowest score of 77.78 and on CAT3 Irish Travelers and Gypsy/Roma obtained the lowest scores of 84.88 and 84.37, respectively. The Gypsy/Roma score of 84.72 in CAT3 is closely similar to that of 83 of 5- to 8-year old Gypsies in Slovakia (N = 728) reported by Raven, Court & Raven (1995) but higher than that of 70 of adult Gypsies in Serbia (N = 323) reported by Rushton, Cvorovic and Bons (2007).

Limitations

A limitation of this review is that all the data are for school students in maintained (i.e. state) schools and do not include the approximately 7 percent of students in private fee-paying schools. These are mainly Whites with affluent parents and have higher average educational attainment and IQs than those in maintained schools. The effect of this will be to reduce the scores of Whites.

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